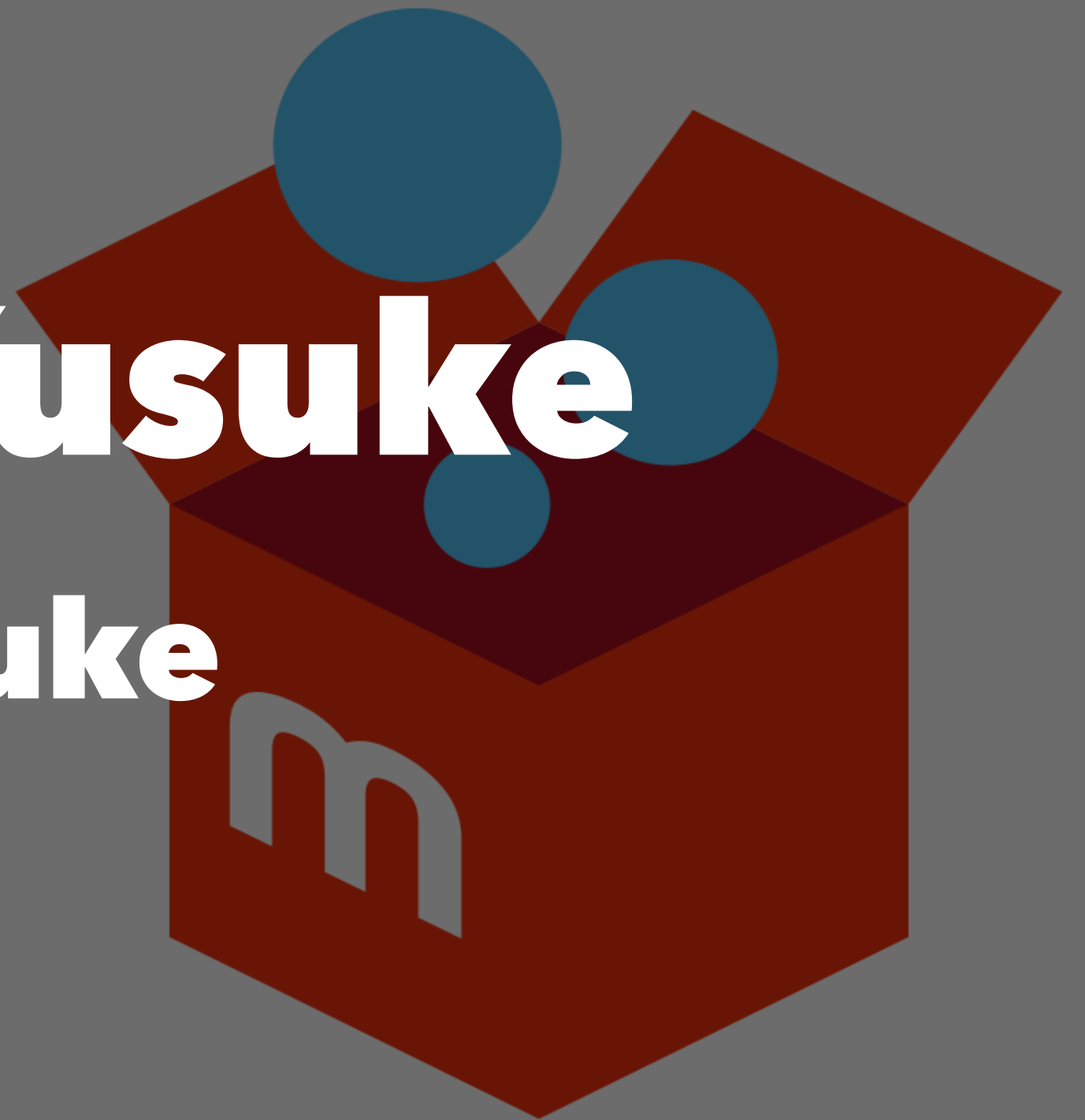# SIL for First Time Learners

Hi, I'm Yusuke

@kitasuke

Why SIL?

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- Better idea of Swift type system

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- Optimizations magic 🔮✨

Why SIL?

- Better idea of Swift type system

- Optimizations magic 🔮✨

- Just for fun!

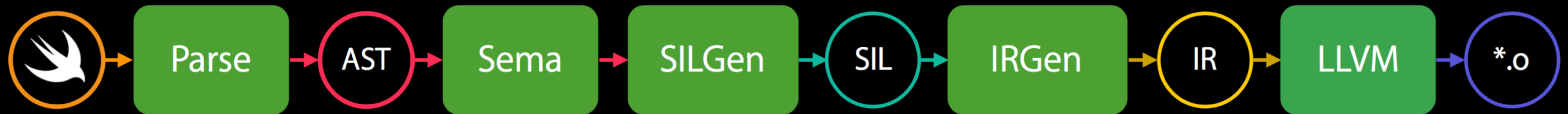# SIL

Swift Intermediate Language

SIL is a language specific Intermediate Representation

Swift Compiler

Swift Compiler

Parse → AST → Sema → SILGen → SIL → IRGen → IR → LLVM → *.o

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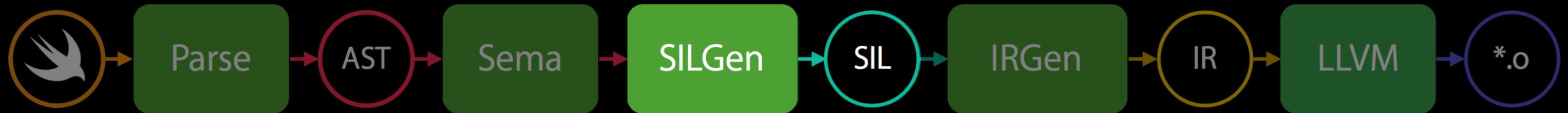
What *SIL* looks like?

sample.swift

```swift
func number() -> Int {
    let x: Int
    x = 1
    return x
}
```

Emit SIL

`$swiftc -emit-sil sample.swift -o sample.sil`

sample.sil

```
sil hidden @_T06sample6numberSiyF : $@convention(thin) () -> Int {
bb0:
    %0 = alloc_stack $Int, let, name "x"
    %1 = integer_literal $Builtin.Int64, 1
    %2 = struct $Int (%1 : $Builtin.Int64)
    store %2 to %0 : $*Int
    dealloc_stack %0 : $*Int
    return %2 : $Int
}
```

Emit SIL with -O

```
$swiftc -emit-sil -O sample.swift -o sample.sil
```

sample.sil with –0

```
sil hidden @_T06sample6numberSiyF : $@convention(thin) () -> Int {
bb0:
    %0 = integer_literal $Builtin.Int64, 1
    %1 = struct $Int (%0 : $Builtin.Int64)
    return %1 : $Int
}
```

sample.swift

```swift
func number() -> Int {
    let x: Int
    x = 1
    return x
}
```

sample.swift

```swift
func number() -> Int {
    return 1
}
```

Diff

```
sil hidden @_T06sample6numberSiyF : $@convention(thin) () -> Int {
bb0:
    %0 = alloc_stack $Int, let, name "x"
    %1 = integer_literal $Builtin.Int64, 1
    %2 = struct $Int (%1 : $Builtin.Int64)
    store %2 to %0 : $*Int
    dealloc_stack %0 : $*Int
    return %2 : $Int
}
```

sample.sil with -O

```
sil hidden @_T06sample6numberSiyF : $@convention(thin) () -> Int {
bb0:
    %0 = integer_literal $Builtin.Int64, 1
    %1 = struct $Int (%0 : $Builtin.Int64)
    return %1 : $Int
}
```

Optimizations 🔮✨

Optimization flag

- `-Onone`

- `-O`

- `-Ounchecked`

- `-Osize` **New!**

Summary

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- Somehow understandable

Summary

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- Better idea of how Swift Compiler works

Summary

- Somehow understandable

- Better idea of how Swift Compiler works

- Definitely worth learning!

References

- swift/docs/SIL.rst

- Swift's High-Level IR: A Case Study of Complementing LLVM IR with Language-Specific Optimization

Thank you!